Complete Summary

GUIDELINE TITLE

ACR Appropriateness Criteria™ for acute hand and wrist trauma.

BIBLIOGRAPHIC SOURCE(S)

American College of Radiology (ACR), Expert Panel on Musculoskeletal Imaging. Acute hand and wrist trauma. Reston (VA): American College of Radiology (ACR); 2001. 7 p. (ACR appropriateness criteria). [27 references]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute hand and wrist trauma

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Internal Medicine
Nuclear Medicine
Orthopedic Surgery
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic for acute hand and wrist trauma

TARGET POPULATION

Patients with acute hand and wrist trauma

INTERVENTIONS AND PRACTICES CONSIDERED

1. Plain films
    - Posteroanterior (PA)
    - Lateral
    - Semipronated oblique
    - Semisupinated oblique (Allstate view)
    - Posteroanterior with ulnar deviation and/or cephalad tube angle
    - Carpal tunnel projection
    - Externally rotated oblique
    - Internally rotated oblique
    - Anterior-posterior (AP) or posteroanterior of thumb
    - Posteroanterior of entire hand or internally rotated oblique of thumb
    - Posteroanterior with valgus stress and contralateral comparison
2. Computed tomography (CT)
    - Prone and supinated, both wrists
    - Prone only, both wrists
3. Magnetic resonance imaging (MRI)
4. Magnetic resonance imaging arthrogram
5. Arthrography
6. Bone scintigraphy
7. Ultrasound

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of recent peer-reviewed medical journals, primarily using the National Library of Medicine's MEDLINE database. The developer identified and collected the major applicable articles.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Delphi Method)
Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed to reach agreement in the formulation of the Appropriateness Criteria. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. If consensus cannot be reached by this method, the panel is convened and group consensus techniques are utilized. The strengths and

weaknesses of each test or procedure are discussed and consensus reached whenever possible.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria and the Chair of the ACR Board of Chancellors.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria™

Clinical Condition: Acute Hand or Wrist Trauma

Variant 1: Wrist trauma, first exam.

Radiologic Exam Procedure	Appropriateness Rating	Comments
PA	9	
Lateral	9	
Semipronated oblique	9	
Semisupinated oblique (Allstate view)	2	
CT	2	
MR	2	
Bone scintigraphy	2	
Appropriateness Criteria Scale		

Radiologic Exam Procedure	Appropriateness Rating	Comments
1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Abbreviations: PA, posteroanterior; CT, computed tomography; MR, magnetic resonance

Variant 2: Suspect acute scaphoid fracture, first exam.

Radiologic Exam Procedure	Appropriateness Rating	Comments
PA	9	
Lateral	9	
Semipronated oblique	9	
PA with ulnar deviation and/or cephalad tube angle	9	
Semisupinated oblique	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 3: Suspect acute distal radius fracture. Radiographs normal. Next procedure?

Radiologic Exam Procedure	Appropriateness Rating	Comments
Cast and repeat radiographs in 10-14 days	8	
MRI	8	If immediate confirmation or exclusion of fracture is required.
CT	5	Only if casted and repeat radiographs are negative.
Bone scintigraphy	2	
Ultrasound	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9		

Radiologic Exam Procedure	Appropriateness Rating	Comments
1=Least appropriate 9=Most appropriate		

Abbreviations: MRI, magnetic resonance imaging; CT, computed tomography

Variant 4: Suspect acute scaphoid fracture. Radiographs normal. Next procedure?

Radiologic Exam Procedure	Appropriateness Rating	Comments
Cast and repeat radiographs in 10-14 days	8	
MRI	8	If immediate confirmation or exclusion of fracture is required.
CT	5	Only if casted and repeat radiographs are negative.
Bone scintigraphy	2	
Ultrasound	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 5: Scaphoid fracture on films. Concern for displacement or age of fracture.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT	9	
Tomography	2	
MRI	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 6: Comminuted distal radius fracture. Suspect incongruity of joint.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT	6	Necessity dependent on local environment.
MRI	4	Useful if integrity of soft tissue affects treatment.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging

Variant 7: Suspect distal radioulnar joint subluxation.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Routine films	9	
CT		
Prone and supinated, both wrists	9	
Prone only, both wrists	2	
MRI (including prone and supine with comparison)	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 8: Suspect hook of the hamate fracture. Initial radiographs normal or equivocal.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Semisupinated oblique projection	9	
Carpal tunnel projection	9	
CT	9	If additional projections are negative or

Radiologic Exam Procedure	Appropriateness Rating	Comments
		equivocal.
Bone scintigraphy	2	
MRI	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 9: Suspect metacarpal fracture or dislocation.

Radiologic Exam Procedure	Appropriateness Rating	Comments
PA	9	
Lateral	9	
Semipronated oblique (off-lateral view)	9	
CT	7	If strong clinical concern exists following negative or equivocal plain film.
Semisupinated oblique (off-lateral view)	4	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Abbreviations: PA, posteroanterior; CT, computed tomography

Variant 10: Suspect phalangeal fracture or dislocation.

Radiologic Exam Procedure	Appropriateness Rating	Comments
PA (entire hand or finger only)	9	
Lateral	9	
Externally rotated oblique	9	
Internally rotated	5	Appropriate but not always routine.

Radiologic Exam Procedure	Appropriateness Rating	Comments
oblique		
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 11: Suspect thumb fracture or dislocation.

Radiologic Exam Procedure	Appropriateness Rating	Comments
AP or PA of thumb	9	
Lateral	9	
PA of entire hand or internally rotated oblique of thumb	9	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Abbreviations: AP, anterior-posterior; PA, posteroanterior

Variant 12: Suspect gamekeeper injury (thumb MCP ulnar collateral ligament injury).

Radiologic Exam Procedure	Appropriateness Rating	Comments
PA	9	
Lateral	9	
MRI	8	
PA with valgus stress and contralateral comparison	6	Controversy concerning accuracy and creation of Stener lesion.
Ultrasound	6	If expertise exists, reliable alternative to MRI.
MRI arthrogram	3	
Arthrography	2	
Appropriateness Criteria Scale		

Radiologic Exam Procedure	Appropriateness Rating	Comments
1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Summary

For most patients with known or suspected trauma of the hand, wrist, or both, the conventional radiographic survey provides adequate diagnostic information and guidance to the surgeon. However, in one large study, wrist fractures, especially those of the distal radius and scaphoid, accounted for more delayed diagnoses than any other traumatized region in patients with initial normal emergency room radiographs. Thus, when initial radiographs are equivocal, or in the presence of certain clinical or radiographic findings, further imaging is appropriate. This may be as simple as an expanded series of special views or fluoroscopic spot films; or may include tomography, arthrography, bone scintigraphy, computed tomography (CT), or magnetic resonance (MR) imaging.

As for the other extremities, a two-view radiographic examination is not adequate for fracture detection in the wrist, hand, or fingers. In most patients with suspected distal radius fractures, a three-view radiographic examination [posteroanterior (PA), lateral, and 45-degree semipronated oblique] is satisfactory to solve radiographically demonstrable clinical problems. Nevertheless, when magnetic resonance imaging (MRI) is performed in addition to radiographs, radiographically occult fractures of the distal radius as well as unsuspected fractures of the carpal bones are frequently demonstrated. While criteria for which patients may benefit from the addition of MRI have not been established, in selected cases where there is a high clinical suspicion of a fracture despite normal radiographs, MRI may prove useful.

Successful treatment of distal radius fractures is predicated on reestablishment of radial length, inclination, and tilt, as well as restoration of the articular surfaces. Less than 2 mm step-off of the distal radial articular surface is considered a congruent reduction necessary for good long-term outcome. When CT examination is performed in addition to radiographs, CT reveals involvement of the radiocarpal and distal radioulnar surfaces, articular surfaces, intraarticular displacements and depressions, and comminution more accurately than radiographs. Measurements of articular surface gap and step-off are more reproducible when performed using CT compared with radiographs, and for displacements >2 mm, there is poor correlation between radiographic and CT findings. Thus, in distal radius fractures where there is a high likelihood of intra-articular incongruence, such as fractures in young adults, which frequently result from high-energy impact loading, selective or even routine use of CT to supplement the standard radiographic examination is warranted. The distal radial articular surface is best evaluated by multislice CT with multiplanar reformatted images; if multislice CT is not available, direct sagittal images can be performed, but these may be difficult to obtain if the patient has a cast or external fixator.

The diagnosis of distal radioulnar joint (DRUJ) subluxation is difficult. The symptoms and physical findings are often nonspecific, and the condition is

virtually impossible to confirm radiographically. Traumatic subluxation or dislocation of the distal radioulnar joint may occur as an isolated injury or be associated with other conditions. If optimum positioning of the wrist is not possible because of the injury or overlying cast, CT scanning is recommended. Both wrists should be scanned for comparison. The wrists should be studied in the pronated and supinated positions, and other clinicians would also add a third position in the neutral orientation.

An additional fourth radiographic projection—an elongated PA view with approximately 30 degrees of cephalad beam angulation and the wrist positioned in 10 to 15 degrees of ulnar deviation—is recommended as a routine whenever there is clinical suspicion of a scaphoid fracture. However, scaphoid fractures are notoriously difficult to see on initial radiographs (regardless of the views), being radiographically occult in up to 20% of cases. Standard practice in patients with clinically suspected scaphoid fractures but normal initial radiographs is to apply a cast and repeat the radiographs in 10–14 days, when resorption at the fracture line should make previously occult fractures visible. Recent studies, though, have shown that bone scintigraphy, CT, MRI (with standard equipment or a dedicated, extremity-only scanner), and sonography can all detect scaphoid fractures earlier, and the application of one of these modalities may eliminate the need for presumptive casting. In this circumstance, cross-sectional imaging may also identify fractures involving bones other than the scaphoid.

For the scaphoid bone, not only is identification of the fracture important, but many surgeons who recommend immediate operative intervention for displaced scaphoid fractures. As little as 1 mm of displacement is significant, resulting in a higher rate of nonunion and avascular necrosis. Dorsal tilting of the lunate on a lateral radiograph may be an indirect sign of scaphoid fracture displacement. In cases where the position of the scaphoid fracture fragments is suspect despite normal radiographs, CT is recommended.

Compared with the scaphoid, the diagnosis of other carpal bone injuries is less problematic. In specific circumstances, however, supplemental studies in addition to the standard wrist examination are useful. Pisiform fractures are best seen on projections like a semisupinated anterior-posterior (AP) or carpal tunnel view, which project the pisiform volar to the rest of the carpus. The same projections may also demonstrate fractures involving the hook of the hamate that are not visible on the standard radiographs. However, if radiographs fail to show a fracture of the hamate hook that is strongly suspected clinically, axial CT examination is indicated.

A standard three-view radiographic examination will reveal most fractures and dislocations of the metacarpals and phalanges. Computed tomography may be useful for surgical planning in fracture-dislocations of the carpometacarpal joints. For phalangeal injuries, some practices include a PA examination of the entire hand, while others limit the entire examination to the injured finger. The addition of an internally rotated oblique projection in addition to the externally rotated oblique may increase diagnostic confidence for phalangeal fractures.

Most fractures of the thumb will be visible on a two-view radiographic examination, although there is a slight increase in diagnostic yield with the addition of an oblique projection, which can be obtained together with a PA

examination of the whole hand. Tears of the ulnar collateral ligament of the thumb metacarpophalangeal (MCP) joint (gamekeeper injury) represent a special problem. Unless there is an associated bony avulsion of the distal metacarpal or proximal phalangeal base, the injury will be radiographically occult. In these cases, a stress examination of the joint with manually applied abduction stress (which can be applied by the patient or the examiner) may show subluxation compared to the contralateral, uninjured side. More important for treatment planning is whether the adductor aponeurosis has become interposed between the torn, displaced ligament and its osseous attachment site—a so-called Stener lesion. Torn ligaments with a Stener lesion require operative repair, while most nondisplaced tears without an interposed aponeurosis will heal with conservative treatment. Conventional arthrography, ultrasound, MRI, and MR arthrography have each been advocated to distinguish ulnar collateral ligament tears with and without Stener lesions. The choice of which modality to use will depend on local availability and expertise. There is a risk of converting a nondisplaced ulnar collateral ligament tear to a displaced one by performance of a stress examination.

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate selection of radiologic exam procedures to evaluate patients with acute hand and wrist trauma

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should

dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

American College of Radiology (ACR), Expert Panel on Musculoskeletal Imaging. Acute hand and wrist trauma. Reston (VA): American College of Radiology (ACR); 2001. 7 p. (ACR appropriateness criteria). [27 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1998 (revised 2001)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria™.

GUIDELINE COMMITTEE

ACR Appropriateness Criteria™ Committee, Expert Panel on Musculoskeletal Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: David A. Rubin, MD; Murray K. Dalinka, MD; Naomi Alazraki, MD; Richard H. Daffner, MD; Arthur A. DeSmet, MD; George Y. El-Khoury, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; Helene Pavlov, MD; Lynne S. Steinbach, MD; Murali Sundaram, MD; Barbara N. Weissman, MD; Robert H. Haralson III, MD; John B. McCabe, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline. It updates a previous version: ACR Appropriateness Criteria™ for acute hand and wrist trauma. Radiology 2000 Jun;215(Suppl):375-8.

The ACR Appropriateness Criteria™ are reviewed every five years, if not sooner, depending on the introduction of new and highly significant scientific evidence. The next review date for this topic is 2006.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- American College of Radiology ACR Appropriateness Criteria™ introduction. Reston (VA): American College of Radiology; 6 p. Available in Portable Document Format (PDF) from the ACR Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This summary was updated by ECRI on July 31, 2002. The updated information was verified by the guideline developer on October 1, 2002.

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